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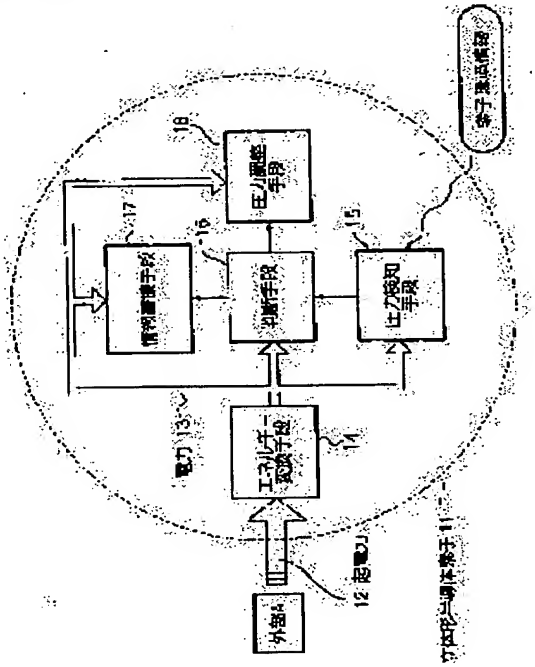
## (54) SOLID-SHAPE SEMICONDUCTOR ELEMENT, INK TANK, INK-JET RECORD DEVICE PROVIDED WITH INK TANK, AND PRESSURE ADJUSTING METHOD

(57)Abstract:
PROBLEM TO BE SOLVED: To adjust pressure inside a container in a manner non-contact with the outside of the container.
SOLUTION: Solid-shape semiconductor element 11 is attached to an ink tank whose inside is kept with negative pressure and has an energy conversion means 14, a pressure detection means 15 and a pressure adjustment means 18. The energy conversion means 14 converts an electromotive force from the outside into electric power 13, then, it operates a pressure detection means 15 and a pressure adjustment means 18. The pressure detection means 15 detects pressure inside the ink tank. The pressure adjustment means 18 introduces the air in the ink tank based on the pressure detected by the pressure detection means 15, and prevents rise in the negative pressure of the ink tank along with the consumption of the ink.



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CLAIMS

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[Claim(s)]

[Claim 1] The solid form semiconductor device which has an energy conversion means to transform a pressure regulation means for the interior to be the solid form semiconductor device allotted to the container maintained at negative pressure, and to adjust the negative pressure inside said container according to the negative pressure inside said container, and the energy given from the outside into the energy of a different class from said energy for operating said pressure regulation means.

[Claim 2] It is the solid form semiconductor device according to claim 1 which has the path where said pressure regulation means opens the interior and the exterior of said container for free passage, and the valve system which open and close this path by being attached where it exposed at least the part to the exterior of said container and at least other parts are exposed to the interior of said container.

[Claim 3] Said valve system is a solid form semiconductor device according to claim 2 which has the moving part which displaces with electrostatic attraction.

[Claim 4] Adjustment of said negative pressure is a solid form semiconductor device according to claim 2 or 3 which opens said path by actuation of said valve system, and is performed by introducing the open air inside said container when the negative pressure in said container becomes high.

[Claim 5] It is a solid form semiconductor device given in claim 1 thru/or any 1 term of 4 to which it has further a pressure detection means to operate with the energy changed with said energy conversion means, and to detect the negative pressure inside said container, and said pressure regulation means adjusts the negative pressure inside said container based on the detection result in said pressure detection means.

[Claim 6] Said pressure detection means is a solid form semiconductor device according to claim 5 which is the pressure sensor which has the diaphragm which consisted of polish recon film, and detects the negative pressure in said container using the change

in resistance by the variation rate of this diaphragm.

[Claim 7] An information storage means to accumulate the negative pressure condition information which said container permits is compared with the detection result in said pressure detection means and the information accumulated in said information storage means. It has further a decision means to judge the need for adjustment of the negative pressure inside said container. Said pressure regulation means It is the solid form semiconductor device according to claim 5 or 6 to which said information storage means and said decision means operate with the energy changed with said energy conversion means by adjusting said negative pressure when it is judged with said decision means that adjustment of negative pressure is required.

[Claim 8] An information storage means to accumulate the negative pressure condition information which said container permits, and a receiving means to receive the signal from the outside, Said pressure detection means is made to detect said negative pressure according to the signal received with said receiving means. The detection result in said pressure detection means is compared with the information accumulated in said information storage means. It has further a decision means to judge whether said detection result fulfills said negative pressure condition information. Said pressure regulation means When said detection result is judged not to fulfill said negative pressure condition information with said decision means, said negative pressure is adjusted. Said information storage means, said receiving means, and said decision means The solid form semiconductor device according to claim 5 or 6 which operates with the energy changed with said energy conversion means.

[Claim 9] Said energy conversion means is a solid form semiconductor device given in claim 1 thru/or any 1 term of 8 which has the oscillator circuit which generates power in the induced electromotive force by electromagnetic induction between the resonance circuits allotted outside.

[Claim 10] The ink tank which is an ink tank which holds the ink which supplies ink to the discharge head which carries out the regurgitation, and has the solid form semiconductor device of a publication in claim 1 thru/or any 1 term of 9.

[Claim 11] The ink tank which has an energy-conversion means transform a pressure regulation means to be the ink tank by which the ink which supplies ink to the discharge head which carries out the regurgitation was held, and the interior was maintained at negative pressure, and to adjust the negative pressure of said interior according to the negative pressure of said interior, and the energy given from the outside into the energy of a different class from said energy for operating said pressure regulation means.

[Claim 12] Said pressure regulation means is an ink tank according to claim 11 which has the path which opens said interior and exterior for free passage, and the valve system which open and close this path.

[Claim 13] Said valve system is an ink tank according to claim 12 which has the moving part which displaces with electrostatic attraction.

[Claim 14] Adjustment of said negative pressure is an ink tank according to claim 12 or 13 which opens said path by actuation of said valve system, and is performed by introducing the open air to said interior when the negative pressure of said interior becomes high.

[Claim 15] It is an ink tank given in claim 11 thru/or any 1 term of 14 to which it has further a pressure detection means to operate with the energy changed with said energy conversion means, and to detect the negative pressure of said interior, and said pressure regulation means adjusts the negative pressure of said interior based on the detection result in said pressure detection means.

[Claim 16] Said pressure detection means is an ink tank according to claim 15 which has the diaphragm which consisted of polish recon film, and detects the negative pressure of said interior using the change in resistance by the variation rate of this diaphragm.

[Claim 17] An information storage means to accumulate the negative pressure condition information which an ink tank permits is compared with the detection result in said pressure detection means and the information accumulated in said information storage means. It has further a decision means to judge the need for adjustment of the negative pressure of said interior. Said pressure regulation means It is the ink tank according to claim 15 or 16 on which said information storage means and said decision means operate with the energy changed with said energy conversion means by adjusting said negative pressure when it is judged with said decision means that adjustment of negative pressure is required.

[Claim 18] An information storage means to accumulate the negative pressure condition information which an ink tank permits, and a receiving means to receive the signal from the outside, Said pressure detection means is made to detect said negative pressure according to the signal received with said receiving means. The detection result in said pressure detection means is compared with the information accumulated in said information storage means. It has further a decision means to judge whether said detection result fulfills said negative pressure condition information. Said pressure regulation means When said detection result is judged not to fulfill said negative pressure condition information with said decision means, said negative pressure is

adjusted. Said information storage means, said receiving means, and said decision means The ink tank according to claim 15 or 16 which operates with the energy changed with said energy conversion means.

[Claim 19] Said energy conversion means is an ink tank given in claim 11 thru/or any 1 term of 18 which has the oscillator circuit which generates power in the induced electromotive force by electromagnetic induction between the resonance circuits allotted outside.

[Claim 20] The ink jet recording device which carries the ink tank of a publication in the discharge head which carries out the regurgitation of the ink, claim 10 which has held the ink which supplies said discharge head, or any 1 term of 19.

[Claim 21] A pressure regulation means for the interior to be allotted to the container maintained at negative pressure, and to adjust the negative pressure inside said container according to the negative pressure inside said container, In order for the energy given from the outside to operate said pressure regulation means, The pressure regulation approach which keeps [ the pressure in said container ] constant the pressure detected with a pressure detection means to detect the pressure in said container, using the solid form semiconductor device which has an energy conversion means to change into the energy of a different class from said energy as compared with the pressure in said container.

[Claim 22] It is the pressure regulation approach according to claim 11 of having the path where said pressure regulation means opens the interior and the exterior of said container for free passage, and the valve system which open and close this path by attaching said solid form semiconductor device in said container where it exposed at least the part to the exterior of said container and at least other parts are exposed to the interior of said container.

[Claim 23] Said valve system is the pressure regulation approach according to claim 2 of having the moving part which displaces with electrostatic attraction.

[Claim 24] Adjustment of said negative pressure is the pressure regulation approach according to claim 22 or 23 which opens said path by actuation of said valve system, and is performed by introducing the open air inside said container when the negative pressure in said container becomes high.

[Claim 25] It is the pressure regulation approach given in claim 21 thru/or any 1 term of 24 to which said solid form semiconductor device has said pressure detection means to operate with the energy changed with said energy conversion means, and said pressure regulation means adjusts the negative pressure inside said container based on the detection result in said pressure detection means.

[Claim 26] Said pressure detection means is the pressure regulation approach according to claim 25 which has the diaphragm which consisted of polish recon film, and detects the negative pressure in said container using the change in resistance by the variation rate of this diaphragm.

[Claim 27] An information storage means to accumulate the negative pressure condition information which said container permits is compared with the detection result in said pressure detection means and the information accumulated in said information storage means. It has further a decision means to judge the need for adjustment of the negative pressure inside said container. Said pressure regulation means It is the pressure regulation approach according to claim 25 or 26 that said information storage means and said decision means operate with the energy changed with said energy conversion means by adjusting said negative pressure when it is judged with said decision means that adjustment of negative pressure is required.

[Claim 28] An information storage means to accumulate the negative pressure condition information which said container permits, and a receiving means to receive the signal from the outside, Said pressure detection means is made to detect said negative pressure according to the signal received with said receiving means. The detection result in said pressure detection means is compared with the information accumulated in said information storage means. It has further a decision means to judge whether said detection result fulfills said negative pressure condition information. Said pressure regulation means When said detection result is judged not to fulfill said negative pressure condition information with said decision means, said negative pressure is adjusted. Said information storage means, said receiving means, and said decision means The pressure regulation approach according to claim 25 or 26 which operates with the energy changed with said energy conversion means.

[Claim 29] Said energy conversion means is the pressure regulation approach given in claim 21 thru/or any 1 term of 28 which has the oscillator circuit which generates power in the induced electromotive force by electromagnetic induction between the resonance circuits allotted outside.

[Claim 30] The ink tank which is an ink tank which holds the ink which supplies ink to the discharge head which carries out the regurgitation, and adjusts an internal pressure to claim 21 thru/or any 1 term of 29 using the pressure regulation approach of a publication.

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[Translation done.]

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DETAILED DESCRIPTION

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[Detailed Description of the Invention]
[0001]
[Field of the Invention] This invention relates to the semiconductor device which has the bulb function to adjust the pressure in a container. Especially this invention detects the pressure in an ink tank, and relates to ink jet recording devices, such as a facsimile printer, a copying machine, etc. which carries the ink tank equipped with the semiconductor device which maintains the pressure in an ink tank at a predetermined pressure according to the detection result, and this component, and this ink tank removable.
[0002]
[Description of the Prior Art] Making ink inject conventionally from two or more injection nozzles prepared in the recording head, in the ink jet recording device which forms an image in a form by the dot pattern, he forms the ink tank which held the ink for record, and is trying to supply the ink of the ink tank to a recording head through an ink supply way by scanning relatively the carriage which carried the recording head to a form.
[0003] The ink which a recording head has the nozzle (delivery) of a large number which carry out the regurgitation of the ink, and was supplied to the recording head from the ink tank is held by the balance of capillarity and surface tension in the nozzle. Therefore, if the internal pressure of an ink tank is higher than atmospheric pressure, since ink will leak and come out from a nozzle, it is necessary to make internal pressure of an ink tank into a negative pressure condition. On the other hand, the negative pressure in an ink tank rises that an ink tank is a well-closed container with consumption of the ink of the ink in an ink tank. When negative pressure was too high, and the ink in a nozzle tends to be drawn in an ink tank side, a recording head tends to be driven and you try to make it breathe out ink from a nozzle, the fault that ink is not breathed out arises.

[0004] Then, the conventional ink tank makes ** in which the ink absorption member was held the condition in which atmospheric air and a free passage are possible, is making an ink absorption member carry out absorption maintenance of the ink, and makes the inside of an ink tank the negative pressure condition while it holds ink absorption members, such as a porous body and a fiber object, in the whole interior or a part.

[0005]

[Problem(s) to be Solved by the Invention] However, by the conventional ink tank mentioned above, since an ink absorption member is made to absorb ink and it is held, the hold effectiveness of ink will fall. Moreover, when the amount of maintenance of ink [ as opposed to an ink absorption member as the flume which is making the interior of an ink tank open for free passage with atmospheric air ] decreases, negative pressure rises and has a possibility of causing the non-regurgitation of the ink from a recording head depending on relation with the pressure of the exterior of an ink tank. Then, if the function to adjust the pressure in an ink tank can be added to an ink tank, since an ink absorption member will also become unnecessary and its hold effectiveness of ink will also improve, such an ink tank is desired. Moreover, in order to adjust the pressure in an ink tank, that it is also direct or indirect needs to get to know the pressure in an ink tank in a certain form.

[0006] In developing the above ink tanks, this invention persons paid their attention to the ball semiconductor of ball Semiconductor of forming a semiconductor integrated circuit on the spherical surface with a diameter of 1mm of a silicon ball. however, the technique which connects ball semiconductors by electric wiring when a thing with such a function is investigated -- only existing (referring to U.S. Pat. No. 5877943) -- it is -- the development with an above-mentioned pressure regulation function and an above-mentioned pressure detection function of the component itself is needed. Moreover, in order for this component to be applicable effective in an ink tank, the technical problem about supply of the power for starting a component also occurred. Since the connecting means of a power source and a component will be needed, the manufacturing cost of a tank will increase and a tank cartridge will become expensive even when a tank becomes large-sized or it equips the tank exterior with a power source if the power source for starting of a component is given to an ink tank, a component is started by non-contact from the exterior, and if it is ****, there is nothing.

[0007] The purpose of this invention is offering the solid form semiconductor device which can adjust the pressure in a container by the exterior of a container, and non-contact.

[0008] Other purposes of this invention are offering the solid semiconductor device which can detect the pressure in a container and can adjust the pressure in a container further based on it in addition to the above-mentioned purpose.

[0009] The further purpose of this invention is offering the ink tank which supplies ink to a recording head good, and the ink jet recording device equipped with the ink tank by adjusting the negative pressure of ink hold circles.

[0010]

[Means for Solving the Problem] The interior is the solid form semiconductor device allotted to the container maintained at negative pressure, and the solid form semiconductor device of this invention for attaining the above-mentioned purpose has an energy-conversion means transform a pressure-regulation means adjust the negative pressure inside said container according to the negative pressure inside said container, and the energy given from the outside into the energy of a different class from said energy for operating said pressure regulation means.

[0011] The interior is allotted to the container maintained at negative pressure, and the solid form semiconductor device of this invention adjusts the negative pressure in a container with a pressure regulation means. By the energy conversion means, the energy for operating a pressure regulation means is transformed into the energy of a class with which the energy from the outside differs, and is given.

[0012] Thus, since the function to adjust the negative pressure in a container is made by the semiconductor device of a solid form, a solid form semiconductor device can be exposed at least for the part to the exterior of a container, and it can expose at least other parts to the interior of a container, and can attach in a container. In this case, by considering as the configuration which has the path which opens the interior and the exterior of a container for free passage for a pressure regulation means, and the valve system which open and close this path, by closing motion of the path by the valve system, the open air can be introduced inside a container and the negative pressure in a container can be adjusted.

[0013] The information about the negative pressure in a container is good also as a configuration whose solid form semiconductor device itself has a pressure detection means to be given from the outside of a solid form semiconductor device, and to detect the negative pressure inside a container. When a solid form semiconductor device has a pressure detection means, as a pressure detection means, it has the diaphragm which consisted of polish recon film, and the pressure sensor which detects the negative pressure in a container using the change in resistance by the variation of this diaphragm can be used.

[0014] The solid form semiconductor device of this invention is preferably applied to the ink tank in the field of ink jet record which holds the ink supplied to a recording head. In order to perform the regurgitation of the ink from a recording head good, the interior of an ink tank is made into the negative pressure condition. However, since the negative pressure in an ink tank is changed in connection with the regurgitation of the ink from a recording head, it is very important to keep the negative pressure in an ink tank suitable, when performing high-definition record.

[0015] Then, the ink tank of this invention is an ink tank which holds the ink which supplies ink to the discharge head which carries out the regurgitation, and has the solid form semiconductor device of above-mentioned this invention.

[0016] Moreover, the ink tank of this invention holds the ink which supplies ink to the discharge head which carries out the regurgitation, is an ink tank by which the interior was maintained at negative pressure, and has an energy-conversion means transform a pressure regulation means adjust the negative pressure of said interior according to the negative pressure of said interior, and the energy given from the outside into the energy of a different class from said energy for operating said pressure regulation means.

[0017] Thus, since it becomes unnecessary to make ink hold to an ink absorption member while the negative pressure in an ink tank is appropriately maintainable by adding the function which the solid form semiconductor device of this invention which has a pressure regulation means has to an ink tank in order to generate negative pressure like before, the hold effectiveness of ink improves. Furthermore, since it becomes unnecessary to make the container or private room of the ink absorption member which generates negative pressure, and dedication, the ink tank of low cost is attained.

[0018] Furthermore, a pressure regulation means according to this invention for the interior to be allotted to the container maintained at negative pressure, and to adjust the negative pressure inside said container according to the negative pressure inside said container, In order for the energy given from the outside to operate said pressure regulation means, The pressure regulation approach which keeps [ the pressure in said container ] constant the pressure detected with a pressure detection means to detect the pressure in said container as compared with the pressure in said container is offered using the solid form semiconductor device which has an energy conversion means to change into the energy of a different class from said energy.

[0019] The ink jet recording device of this invention carries the ink tank of the discharge head which carries out the regurgitation of the ink, and this invention which has held the ink which supplies said discharge head.

[0020] Moreover, with the "solid form" of the "solid form semiconductor device" in this specification, all various solid forms, such as the triangle pole, a ball, a hemisphere, the square pole, a spheroid, and 1 shaft body of revolution, are included.

[0021]

[Embodiment of the Invention] Hereafter, the gestalt of operation of this invention is explained with reference to a drawing.

[0022] (Gestalt of the 1st operation) Drawing 1 is the outline sectional view of the ink tank by the gestalt of operation of the 1st of this invention, and drawing 2 is a block block diagram showing the internal configuration of the solid form semiconductor device shown in drawing 1 , and the exchange with the exterior.

[0023] As shown in drawing 1 , the ink tank 1 of this operation gestalt has the ink hold room 2 in which ink is held, and the ink feed hopper 3 for supplying the ink in the ink hold room 2 to a recording head 4. It fixes and connects with the ink feed hopper 3, and a recording head 4 is removable on the ink tank 1, or making the ink supplied from the ink tank 1 breathe out from two or more deliveries (un-illustrating) based on a record signal, and records on recorded media. In the recording head 4, the ink supplied from the ink tank 1 is held by the balance of capillarity and surface tension in the delivery, and in order to prevent ink leaking and coming out from a recording head 4 in addition to the time of record actuation, the inside of the ink hold room 2 is maintained at negative pressure.

[0024] Moreover, the solid form semiconductor device (only henceforth a "component") 11 is being fixed to the ink tank 1, where it exposed at least the part to the exterior of the ink tank 1 and at least another part is exposed in the ink hold room 2. the location where the part exposed in the ink hold room 2 does not touch ink in the busy condition of the ink tank 1 at least although especially the installation location of a component 11 is not limited -- it is preferably attached in the upper wall of the ink tank 1.

[0025] The ink tank 1 is the container with which the interior was sealed substantially, and in order to make it ink not have leakage appearance from the delivery of a recording head 4 in addition to the time of record, the inside of the ink hold room 2 is maintained at fixed negative pressure for it. However, since the ink tank 1 is the container with which the interior was sealed substantially, as for the internal pressure of the ink tank 1, a fall, i.e., negative pressure, becomes high with consumption of the ink in the ink hold room 2. When the negative pressure of the ink tank 1 becomes high too much, even if you are going to make it breathe out ink from a recording head 4, ink may become is hard to be breathed out, and the situation where ink finally is not breathed out may arise. Then, the component 11 of this operation gestalt detects the

pressure in the ink tank 1, makes the interior and the exterior of the ink tank 1 open for free passage based on the detection result, and has the function to suppress the rise of the negative pressure in the ink tank 1.

[0026] The configuration on the function of this component 11 is explained with reference to drawing 2 R> 2.

[0027] The component 11 is equipped with an energy conversion means 14 to change into power 13 the electromotive force 12 supplied by non-contact toward the component 11 from the exterior A of the ink tank 1, and a pressure detection means 15 to start with the power 13 changed with the energy conversion means 14, the decision means 16, the information storage means 17 and the pressure regulation means 18 as shown in drawing 2 . Electromagnetic induction, heat, light, a radiation, etc. are applicable to the electromotive force supplied in order to operate a component 11. Moreover, as for the energy conversion means 14 at least, it is desirable to be formed a front face or near a front face a component 11.

[0028] The pressure detection means 15 detects the pressure in the ink tank which is the perimeter environmental information of a component 11, and outputs it to the decision means 16. As a pressure detection means 15, diaphram is formed in the front face of a component 11, and the pressure sensor which detects a pressure from the variation rate of this diaphram based on pressure fluctuation is mentioned, for example. The decision means 16 compares the tank internal pressure information detected with the pressure detection means 15 with the information memorized by the information storage means 17, and judges whether it is necessary to transmit the detected tank internal pressure information to the pressure regulation means 18. The information storage means 17 accumulates the tank internal pressure information itself detected with the conditions and the pressure detection means 15 of the internal pressure which is the upper limit of negative pressure required in order to make ink breathe out from the recording head 4 attached in the ink tank 1.

[0029] The pressure regulation means 18 is driven with the power given by the energy conversion means 14 based on the instruction from the decision means 16, and adjusts the pressure in the ink tank 1. As a pressure regulation means 18, the valve system which makes the interior and the exterior of the ink tank 1 open for free passage can be used, for example. In this case, adjustment of the internal pressure in the ink tank 1 can take the difference of the result detected with the pressure detection means 15, and the value of the ink tank internal pressure accumulated in the information storage means 17, can control the time amount which opens a valve system according to that magnitude, and can make internal pressure of the ink tank 1 suitable internal pressure.

[0030] Drawing 3 is a flow chart for explaining actuation of the component shown in drawing 2 . If drawing 1 · drawing 3 are referred to and electromotive force 12 will be given toward a component 11 from the exterior A of the ink tank 1, the energy conversion means 14 will change electromotive force 12 into power 13, and will start the pressure detection means 15, the decision means 16, the information storage means 17, and the pressure regulation means 18 with the power 13.

[0031] The pressure detection means 15 which started detects the internal pressure of the ink tank 1 (step S11 of drawing 3 ). Next, from the information storage means 17, the decision means 16 reads are recording information (step S12 of drawing 3 ), compares the tank internal pressure information detected as this read condition, and judges the need for adjustment of the internal pressure of the ink tank 1 (step S13 of drawing 3 ). In addition, as for the ink tank 1, the initial pressure is set up with the test equipment of dedication at the time of the factory shipments after ink restoration (step S16 of drawing 3 ), and the information is written in ROM in a component 11 as initial information (step S17 of drawing 3 ) (part shown as proper range of drawing 19 ).

[0032] In step S13, the internal pressure of the detected ink tank 1 is within the limits of the internal pressure of the ink tank 1 accumulated in the information storage means 17, when it is judged that the decision means 16 does not need to adjust the internal pressure of the ink tank 1, the pressure regulation means 18 is not driven but the internal pressure information on the present ink tank 1 is accumulated in the information storage means 17 (step S14 of drawing 3 ). In addition, the example of the accumulated internal pressure information is shown in drawing 19 . Consequently, while aging of the negative pressure accompanying the ink consumption in the ink tank 1 and a recording head scan serially, aging of negative pressure can be grasped. The information can be transmitted to the control circuit of a recording head, and the recovery action of a recording head and a setup of drive conditions can be made to optimize.

[0033] In step S13, moreover, the negative pressure of the detected ink tank 1 When it is judged that it is lower than the upper limit of the internal pressure of the ink tank 1 accumulated in the information storage means 17, and the decision means 16 needs to adjust the internal pressure of the ink tank 1 It is changed by the energy conversion means 15, and the pressure regulation means 18 drives with power 13, and when the pressure regulation means 18 is a valve system, the internal pressure of the ink tank 1 is adjusted as mentioned above, for example (step 15 of drawing 3 ).

[0034] If the ink jet recording device of a serial mold is mentioned as an example as a location desirable although a means to supply electromotive force to a component 11 as

external energy is established when used for an ink jet recording device, a recording head, carriage, the recovery position of a recording head, or a carriage return position will be mentioned. The internal pressure of an ink tank can also be adjusted without being able to know the condition inside an ink tank, for example, actually equipping an ink jet recording device with an ink tank in works or a dealer besides this, even if there is no ink jet recording device if the equipment which has a means to supply electromotive force is used.

[0035] As explained above, by forming a component 11 in the ink tank 1, only by giving electromotive force 12 to a component 11, the internal pressure of the ink tank 1 can be detected and it can adjust to predetermined internal pressure. Consequently, it cannot be based on the ink residue in the ink tank 1, but the inside of the ink tank 1 can be maintained at the good negative pressure condition suitable for the regurgitation of the ink from a recording head 4, and ink can be stabilized and supplied to a recording head 1. Moreover, since it is not necessary to make an ink absorption member absorb ink and to hold it like before in order to make the inside of the ink tank 1 into a negative pressure condition, the hold effectiveness of ink can be raised.

[0036] Moreover, according to this operation gestalt, since the component 11 has the energy conversion means 15, a component 11 can be used even if it is a difficult part for it to become unnecessary to perform direct electric wiring with the exterior, and to perform direct electric wiring with the exterior. When a component 11 has the energy conversion means 15, it becomes unnecessary furthermore, to form a means (this example power source) to accumulate the electromotive force for operating a component 11 in a component 11. Therefore, the miniaturization of a component 11 is attained, and a component 11 can be used even if it is which part in an object. That is, a component 11 can be formed in the most suitable location of the ink tank 1. In addition, although electromotive force was supplied to the component 11 by the component 11 and non-contact with this gestalt, after contacting the exterior temporarily and supplying electromotive force, the gestalt used as the exterior and non-contact is sufficient.

[0037] (Gestalt of the 2nd operation) Drawing 4 is a block block diagram showing the internal configuration of the solid form semiconductor device by the gestalt of operation of the 2nd of this invention, and the exchange with the exterior. The solid form semiconductor device (only henceforth a "component") 21 of the gestalt shown in this drawing An energy conversion means 24 to change into power 23 the electromotive force 22 which is being fixed to the ink tank (un-illustrating) like the component 11 shown in drawing 1 , and was supplied by non-contact toward the component 21 from the exterior A of an ink tank, It has a pressure detection means 25 to start with the power changed

with the energy conversion means 24, the decision means 26, the information storage means 27, the pressure regulation means 28, and the receiving means 29. Unlike the 1st operation gestalt, the point of others that this operation gestalt has the point 29, i.e., a receiving means, of having a reception function with the gestalt of the 1st operation is the same as the 1st operation gestalt. Electromagnetic induction, heat, light, a radiation, etc. are applicable to the electromotive force 22 supplied in order to operate a component 21. Moreover, as for the energy conversion means 24 and the receiving means 29 at least, it is desirable to be formed a front face or near a front face a component 21.

[0038] The pressure detection means 25 detects the pressure in the ink tank which is the perimeter environmental information of a component 21, and outputs it to the decision means 26. The receiving means 29 receives the input signal 30 from the different outside B from the exterior A which is the source of supply of electromotive force 22, or Exterior A. The decision means 26 makes the pressure detection means 25 detect ink tank internal pressure, compares this detected ink tank internal-pressure information with the information memorized for the information-storage means 27, and judges whether the conditions for making ink breathe out fulfill according to the input signal from the receiving means 29 from the recording head (un-illustrating) by which the detected ink tank internal-pressure information is attached in an ink tank. The information storage means 27 accumulates the ink information itself which came to hand from this condition or the pressure detection means 25. The pressure regulation means 28 is driven with the power given by the energy conversion means 24 based on the instruction from the decision means 26, and adjusts the internal pressure of an ink tank. As the pressure detection means 25 and a pressure regulation means 28, the same thing as the 1st operation gestalt can be used.

[0039] Drawing 5 is a flow chart for explaining actuation of the component shown in drawing 4 . If drawing 4 and drawing 5 are referred to and electromotive force 22 will be given toward a component 21 from Exterior A, the energy conversion means 24 will change electromotive force 22 into power 23, and will start the pressure detection means 25, the decision means 26, the information storage means 27, the pressure regulation means 28, and the receiving means 29 with the power.

[0040] The input signal 30 transmitted to the component 21 from Exterior A or Exterior B in this condition is received by the receiving means 29 (step S21 of drawing 5 ). This input signal 30 is a signal for asking the internal pressure of an ink tank to a component 21. An input signal 30 may be given to a component 21 with electromotive force 22.

[0041] If an input signal 30 is received, the decision means 26 will make the pressure detection means 25 detect the internal pressure of an ink tank (step S22 of drawing 5 ), and will judge whether the internal pressure which read and (step S23 of drawing 5 ) detected are recording information fulfills the above-mentioned conditions from the information storage means 27 (step S24 of drawing 5 ). In addition, as for the ink tank, the initial pressure is set up with the test equipment of dedication at the time of the factory shipments after ink restoration (step S26 of drawing 5 ), and the information is written in (the part shown as proper range of drawing 20 ) as initial information (step S27 of drawing 5 ) in ROM of a component 21.

[0042] In step S24, when it is judged that the detected internal pressure does not fulfill conditions, the pressure regulation means 28 is driven and the internal pressure of an ink tank is adjusted (step S25 of drawing 5 ). On the other hand, when the detected internal pressure fulfills conditions, internal pressure **** of the present ink tank is accumulated in the information storage means 27 (step S28 of drawing 5 ). In addition, the example of the accumulated internal pressure information is shown in drawing 20 . Consequently, while aging of the negative pressure accompanying the ink consumption in an ink tank and a recording head scan serially, aging of negative pressure can be grasped. The information can be transmitted to the control circuit of a recording head, and the recovery action of a recording head and a setup of drive conditions can be made to optimize.

[0043] Since it has the function to receive the signal from the outside according to this operation gestalt, in addition to the effectiveness by the gestalt of the 1st operation, it becomes possible to answer to the question by the signal of various classes from the outside, and information can be exchanged in a component and the exterior.

[0044] In addition, although this operation gestalt explained the case where the pressure detection means 25 and the pressure regulation means 28 were formed in one component 21 These pressure detection means and a pressure regulation means are formed in a separate component. With one component While detecting the internal pressure of an ink tank, it is good also as a configuration which adjustment of the internal pressure of an ink tank judges whether it is the need, transmits to the component of another side where that was prepared in the pressure regulation means when adjustment is required, and adjusts a pressure with the component of another side.

[0045] (Gestalt of other operations) Below, the operation gestalt of others applicable to each operation gestalt mentioned above is explained.

[0046] <Energy conversion means> The case where power is generated about the

concrete example of an energy conversion means using electromagnetic induction is mentioned as an example, and is explained.

[0047] Drawing 6 is drawing for explaining the example which generates power using the electromagnetic induction of the energy conversion means which is the component of the solid form semiconductor device of this invention.

[0048] In drawing 6 , both the coils La and L are made to adjoin and the external resonance circuit 101 which has Coil La, and the oscillator circuit 102 which has coil L ** are installed. If Current Ia is passed in Coil La through the external resonance circuit 101 in this condition, the magnetic flux B which pierces through the coil L of an oscillator circuit 102 according to Current Ia will arise. Here, since the magnetic flux B which pierces through Coil L will change if Current Ia is changed, induced electromotive force V arises in Coil L. Therefore, an oscillator circuit 102 is made as an energy conversion means to the solid form semiconductor device of this invention, and the power which operates a component can be generated in the induced electromotive force by the electromagnetic induction from the outside by arranging the external resonance circuit 101 for example, in the ink jet recording device of the exterior of the component so that the coil L of the oscillator circuit 102 by the side of a component and the coil La of the resonance circuit 101 of the component exterior may adjoin.

[0049] Since the magnetic flux B which pierces through the coil L of an oscillator circuit 102 made as an energy conversion means for the component is proportional to number-of-turns Na of the coil La of the external resonance circuit 101, and the product of Current Ia, it sets a proportionality constant to k, and it is [0050].

[Equation 1]

$$B = k N_a I_a \qquad (1)$$

It is come out and expressed.

[0051] Moreover, the electromotive force V produced in Coil L when the number of turns of Coil L is set to N is [0052].

[Equation 2]

$$V = -N\frac{dB}{dt}$$

$$= kN_a N\frac{dI_a}{dt}$$

$$= -M\frac{dI_a}{dt} \qquad (2)$$

It becomes.

[0053] When distance with the coil L which made the permeability of the core of Coil L to mua, and made the field for Coil La and the component of H and the external resonance circuit 102 is set to z here, magnetic flux B is [0054].

[Equation 3]

$$B = \mu_a H(z)$$

$$= \frac{\mu_a N_a I_a r_a^3}{2(r_a^2 + z^2)^{3/2}} \qquad (3)$$

It becomes.

[0055] Moreover, mutual-inductance M of (2) types is [0056].

[Equation 4]

$$M = \frac{\mu N}{\mu_a I_a}\int_S B \cdot dS$$

$$= \frac{\mu \mu_a r_a^2 N_a NS}{2\mu_0 (r_a^2 + z^2)^{3/2}} \qquad (4)$$

It becomes. Here, muo is the permeability in a vacuum.

[0057] And the impedance Z of the dispatch circuit 102 made for the component is [0058].

[Equation 5]

$$Z(\omega) = R + j\left(\omega L - \frac{1}{\omega L}\right) \qquad (5)$$

It is expressed and the impedance Za of the external resonance circuit 101 is [0059].

[Equation 6]

$$Z_a(\omega_0) = R_a + j\omega L_a - \frac{\omega^2 M^2}{Z(\omega)} \qquad (6)$$

becoming . -- here, J expresses magnetization.

[0060] The impedance Z0 when this external resonance circuit 101 resonates (current value: when Ia becomes max) is [0061].

[Equation 7]

$$Z_0(\omega_0) = R_a + j L_a \omega_0 - \frac{\omega_0^2 M^2}{R} \qquad (7)$$

Delay phi of the phase of a next door and this resonance circuit 102 is [0062].

[Equation 8]

$$\tan\phi = \frac{j L_a \omega_0 - \frac{\omega_0^2 M^2}{R}}{R} \qquad (8)$$

It becomes.

[0063] And the resonance frequency fo of this external resonance circuit 101 is [0064].

[Equation 9]

$$f_0 = \frac{1}{2\pi\sqrt{LC}} \qquad (9)$$

It comes out and asks.

[0065] If the impedance Z of the oscillator circuit 102 made for the component changes from the above relation according to change of the ink in an ink tank, the frequency of the external resonance circuit 101 will change and change of the above-mentioned ink will appear in the amplitude and phase contrast of an impedance Za of the external resonance circuit 101. Furthermore, the ink residue (namely, change of Z) is also contained in this phase contrast and amplitude.

[0066] For example, since the output (impedance Z) from the oscillator circuit 102 made for the component changes by changing the resonance frequency fo of the external resonance circuit 101 according to a surrounding environmental variation, the existence and the ink residue of ink are also detectable by detecting frequency dependent [ this ].

[0067] Therefore, only as an energy conversion means to generate power, the oscillator circuit 102 made for a component is the relation of the oscillator circuit 102 and external resonance circuit 101, and can also be used as a means to detect change of the ink in an ink tank.

[0068] Although electromagnetic induction with a coil was used for the external energy which supplies the power which starts a component in the example shown in drawing 6 , the light and darkness of light may be used in addition to this. When changing the light and darkness of light into an electrical signal, power can be generated according to the photoconductive effect using the ingredient (for example, photoconductor) from which resistance changes with the exposures of light. As photoconductor, a binary alloy/ternary alloys, such as CdS, InSb, and Hg0.8Cd0.2Te, GaAs, Si, Va-Si, etc. are used. Furthermore, when using heat as electromotive force, power can be generated according to the quantum effectiveness from the radiant energy of the matter.

[0069] <Pressure regulation means> An example of the concrete structure of a pressure regulation means is explained with the production process.

[0070] Drawing 7 is drawing explaining the case where an example of the structure of the pressure regulation means formed in the solid form semiconductor device of this invention is formed in the spherical silicon used for the ball semiconductor who mentioned above, and drawing 8 is drawing explaining the production process of the pressure regulation means shown in drawing 7 . In addition, by drawing 7 and drawing 8 , the cross section passing through the core of spherical silicon shows.

[0071] As shown in drawing 7 , the base electrode 201 is formed in two parts of spherical silicon 200 which face mutually, respectively. Moreover, spherical silicon 200 is surrounded and the SiN film 206 is formed. The SiN film 206 serves as the moving part 210,211 where each base electrode 201 and the field which counters opened the front face and spacing of spherical silicon 200, and the cantilevered suspension was carried out. The base electrode 201 and the bulb electrode 205 which counters are prepared for each moving part 210,211, respectively. Moreover, the field partially covering the base electrode 201 of one base electrode 201 to another side in the SiN film 2106 opens spherical silicon 200 and spacing, it is formed, and this part serves as the path 212 which enables circulation of the gas between the moving-part 211 sides of another side one moving-part 210 side.

[0072] Next, the manufacture approach of the pressure regulation means shown in drawing 7 is explained with reference to drawing 8 .

[0073] First, to the spherical silicon 201 shown in drawing 8 (a), on [ all ] a front face, as shown in drawing 8 (b), the PSG (phospho silicate glass) film 202 is formed. In addition, before forming the PSG film 202, the base electrode 201 is beforehand formed in two places which become symmetrical to the core at spherical silicon 201, respectively. Then, as shown in drawing 8 (c), in order to form the opening 203 which exposes a base electrode 201 on the PSG film 202 at least, and the path mentioned later, it leaves the

part used as a path using a photolithography process, and patterning of the PSG film 202 is carried out.

[0074] And a base electrode 201 and the PSG film 202 are covered, as shown in drawing 8 (d), with a metal CVD method, the Cu film 204 is formed, it leaves the parts of a base-electrode 201 top and its perimeter, and the Cu film 204 is removed. then, the part which serves as moving part later mentioned on the Cu film 204 as shown in drawing 8 (e) -- the bulb electrode 205 -- forming -- further -- the perimeter of spherical silicon 200 -- these PSGs film 202, the Cu film 204, and the bulb electrode 205 -- covering -- PECVD -- the SiN film 206 is formed using law.

[0075] Furthermore, as shown in drawing 8 (f), patterning of the SiN film 206 is carried out to the configuration of moving part. The top view of the outline of the component in this phase is shown in drawing 9 . Of patterning of the SiN film 206, as shown in drawing 9 , slit 206a of a radial is formed in the part on the Cu film 204 of the SiN film 206. And a solvent dissolves and removes suitably the Cu film 204 and the PSG film 202. Thereby, as shown in drawing 8 (g), it has the moving part 210,211 which opens spherical silicon 200 and spacing in two places, the upper part and the lower part, respectively, is supported, and acts as a valve, and the solid form semiconductor device which has the structure with which the space between the upside moving part 210 and spherical silicon 200 and the space between the lower moving part 211 and spherical silicon 200 were mutually connected by the path 212 is obtained.

[0076] In case this solid form semiconductor device is attached in an ink tank, one moving part 210 makes it located in the outside of an ink tank, the moving part 211 of another side makes it located inside an ink tank, and it is attached.

[0077] Next, the pressure regulation approach in the ink tank by which the solid form semiconductor device which has the pressure regulation means mentioned above was attached is explained with reference to drawing 7 , drawing 10 , and drawing 11 .

[0078] Drawing 10 is the representative circuit schematic of the electric configuration relevant to the pressure regulation means shown in drawing 7 . Capacitor C is constituted between the bulb electrodes and base electrodes which counter mutually so that clearly from this drawing. Moreover, drawing 11 is the timing chart of an example of the impression signal to the bulb electrode and base electrode of the pressure regulation means shown in drawing 7 .

[0079] First, the base electrode 201 and the bulb electrode 205 are set as GND level. And a high-level signal is impressed to a base electrode 201, and a high-level signal is further impressed to the bulb electrode 205. Since electrostatic attraction works between the bulb electrode 205 and a base electrode 201 and the bulb electrode 205 can

draw near to a base electrode 201 by this, as a result, moving part 210,211 displaces to the spherical silicon 200 side, spherical silicon 200 is contacted, and the both ends of a path 212 are closed. That is, the outside and the inside of an ink tank will be in the condition of not being open for free passage.

[0080] This condition is made into an initial state and the ink in an ink tank is consumed. And the internal pressure of an ink tank is detected with a pressure detection means (un-illustrating) if needed. If the internal pressure which the negative pressure in an ink tank rose and was detected becomes higher than predetermined negative pressure with consumption of the ink in an ink tank, a low-level signal will be impressed to the bulb electrode 205. Thereby, moving part 210,211 separates from spherical silicon 200, and a path 212 is opened wide. Consequently, air goes into the interior from the exterior of an ink tank through a path 212, and the negative pressure in an ink tank falls. And if the negative pressure in an ink tank becomes a predetermined value, a high-level signal will be again impressed to the bulb electrode 205, the variation rate of the moving part 210,211 will be carried out, and a path 212 will be closed.

[0081] Also by controlling the time amount which opens a path 212 according to the difference of the detection result in a pressure detection means, and the optimal negative pressure value, or repeating disconnection of fixed time amount of a path 212 two or more times, decision whether the negative pressure in an ink tank became a predetermined value can be good, can detect the pressure in an ink tank on real time with a pressure detection means, and can also be performed based on the result.

[0082] Although the example shown in drawing 7 showed the structure of having moving part 210,211 to the both sides of the outside of an ink tank, and the inside, as long as it can intercept the outside and the inside of an ink tank, you may prepare only in either.

[0083] <Pressure detection means> An example of the concrete structure of a pressure detection means is explained.

[0084] Drawing 12 is drawing explaining the case where it forms in the part which surrounded an example of the structure of the pressure detection means formed in the solid form semiconductor device of this invention with the broken line of the component shown in drawing 7 , i.e., the path which constitutes a pressure regulation means, and drawing 1313 and drawing 14 are drawings explaining the production process of the pressure detection means shown in drawing 12 . In addition, in drawing 12 - drawing 14 , the same sign as drawing 7 is attached about the same part as drawing 7 . Moreover, since the example shown in drawing 12 has established the pressure detection means in

the path 212, moving part does not prepare in the interior of an ink tank correspond at a side so that the pressure inside an ink tank can be detected, where a valve is closed.

[0085] The pressure detection means shown in drawing 12 is a semiconductor strain gage using the piezoresistance condenser in the polish recon film, and is formed in the part of the path 212 of the pressure regulation means mentioned above. The polish recon resistive layer 221 is formed as a diaphragm which came floating to the front face of spherical silicon 200 partially through the cavernous section 225. The wiring 222 which consists of Cu or W is formed in the both ends in the field to which the polish recon resistive layer 221 came floating. And the polish recon resistive layer 221 and wiring 222 are covered by the protective coat 223 which consists of SiN, and, thereby, the pressure detection means is constituted.

[0086] Next, the manufacture approach of the pressure detection means shown in drawing 12 is explained with reference to drawing 13 and drawing 14 . In addition, the following explanation explains as what forms a pressure detection means at the process after the condition which showed in drawing 8 (d).

[0087] As shown in drawing 13 (a), the PSG film 202 is formed in the front face of spherical silicon 200. As shown in drawing 13 (b), patterning of this PSG film 202 is carried out to the configuration of the cavernous section 225 (refer to drawing 12 ) according to a photolithography process. Subsequently, as shown in drawing 13 (c), the PSG film 202 by which patterning was carried out, and spherical silicon 200 are covered, the polish recon resistive layer 221 is formed by the plasma-CVD method, and patterning is carried out to the predetermined configuration used as a diaphragm. Subsequently, as shown in drawing 13 (d), metal membranes, such as Cu or W, are formed with a metal CVD method on the polish recon resistive layer 221, patterning of this is carried out, and wiring 222 is formed in the part equivalent to the both ends of a diaphragm.

[0088] If wiring 222 is formed on the polish recon resistive layer 221, as shown in drawing 14 (e), these will be covered, the SiN film will be formed by the plasma-CVD method, and a protective coat 223 will be formed. Furthermore, on it, as shown in drawing 14 (f), as the PSG film 224 is formed by the plasma-CVD method and it is shown on a protective coat 223 at drawing 14 (g), the SiN film 206 is formed. The condition which shows in drawing 14 (g) is equivalent to the condition which shows in drawing 8 (e).

[0089] After it, in order to form the moving part 210,211 which showed drawing 8 , patterning of the SiN film 206 is carried out ( drawing 8 (f)), and finally, by removing the PSG film 202,224, as shown in drawing 14 (h), a pressure detection means is formed in

a path 212.

[0090] Next, the pressure detection principle by the pressure detection means shown in drawing 12 is explained with reference to drawing 15 which is the circuit diagram of the circuit which carries out the monitor of the output from a polish recon resistive layer shown in drawing 12 and drawing 12 .

[0091] When the resistance at the time of usual [ of the polish recon resistive layer 221 ] is set to r in drawing 15 , in an ammeter 230, it is i=VDD/{R0+Rxr (R+r)}. (10)

****** flows. Moreover, polish recon has the property which resistance increases in proportion [ almost ] to the variation rate. Therefore, if the polish recon resistive layer 221 displaces by change of the pressure of a path 212, the current i which the resistance r of the polish recon resistive layer 221 changes, consequently is measured with an ammeter 230 will change. That is, change of Current i shows the amount of displacement of the polish recon resistive layer 221, and the pressure of a path 212, i.e., the internal pressure of an ink tank, becomes detectable by it.

[0092] Furthermore, if it explains to a detail, when it will set the die length of the polish recon resistive layer 221 to L and the cross section will be set to S, resistivity rho is used and total resistance R is R=rho last shipment. (11)

It is come out and expressed. Here, if the polish recon resistive layer 221 changes in connection with pressure variation, the die length will become long with L+delta L, and resistance will increase it. On the other hand, the cross section becomes small with S-delta S, and rho also changes with rho'. The relation between increment deltaR of resistance and increment section deltaL of die length is [0093].

[Equation 10]

$$R+\Delta R=\frac{\rho'\ (L+\Delta L)}{S-\Delta S}$$

$$\cong\frac{\rho L}{S}+\Delta L\frac{\rho'}{S-\Delta S}\qquad(12)$$

It is come out and expressed and is [0094] further.

[Equation 11]

$$\frac{\Delta R}{R}=\frac{\rho'}{\rho}\times\frac{S}{S-\Delta S}\times\frac{\Delta L}{L}$$

$$=k_g\times\frac{\Delta L}{L}\qquad(13)$$

It becomes. Here, kg expresses the resistance value-change multiplier to distortion.

[0095] And it can ask for pressure fluctuation by detecting resistance value-change part deltaR using a bridge circuit etc.

[0096] Polish recon has the property that distortion resistance changes with temperature. Therefore, it is desirable to have further the temperature sensor which carries out the monitor of the temperature of the polish recon resistive layer 221 with a pressure detection means to have the polish recon resistive layer 221. That is, by supplying an electrical potential difference VDD to the polish recon resistive layer 221 through a temperature sensor, resistance change of the polish recon resistive layer 221 by change of environmental temperature can be compensated, and the internal pressure of an ink tank can be detected more correctly.

[0097] <Drive circuit> As mentioned above, as for the solid form semiconductor device of this invention, a pressure regulation means, a pressure detection means, etc. are established. Therefore, the circuit for driving these is also made by the solid form semiconductor device. N-MOS circuit component can be used as a drive circuit element. The typical sectional view which cut the solid form semiconductor device of this invention to drawing 16 so that it might travel through N-MOS circuit component is shown.

[0098] According to drawing 16 , by the impurity installation and diffusion of an ion plantation etc. using a general Mos process, P-Mos450 is constituted by the N type well field 402, and N-Mos451 is constituted by the Si substrate 401 of P conductor to the P type well field 403. P-Mos450 and N-Mos451 consist of the source fields 405 and drain field 406 grades which carried out impurity installation of the gate wiring 415 by poly-Si deposited on 4000A or more thickness of 5000A or less with the CVD method through gate dielectric film 408 of 100A of thickness numbers, respectively and N type, or P type, and C-Mos logic is constituted by these P-Mos450 and N-Mos451.

[0099] The N-Mos transistor 301 for a component drive is too constituted from a drain field 411 on the P type well substrate 402, a source field 412, and gate wiring 413 grade by processes, such as impurity installation and diffusion.

[0100] Here, if the N-Mos transistor 301 is used as a component drive driver, the distance L between the drain gates which constitute one transistor will be set to about 10 micrometers at the minimum value. Although one of the 10-micrometer items of the is the width of face of the source and the contact 417 of a drain and the amount of those width of face is 2x2 micrometers, since the one half serves as combination with the next transistor, it is 2 micrometers of 1/the 2 in practice. Everything but the items is 4 micrometers for the width of face of 2x2 micrometers [ for the distance of contact 417 and the gate 413 ] 4 micrometers, and the gate 413, and is set to a total of 10 micrometers.

[0101] Between each component, the oxide-film isolation region 453 is formed of with a

5000A or more thickness [ thickness 10000A or less ] field oxidation, and it is detached by the component. This field oxide acts as an accumulation layer 414 of an eye further.

[0102] After each component is formed, and an interlayer insulation film 416 accumulates on the thickness which is about 7000A by PSG by the CVD method, the BPSG film, etc. and is made it by heat treatment in flattening processing etc., wiring is performed through the contact hole by the aluminum electrode 417 used as the 1st wiring layer. Then, the interlayer insulation films 418, such as SiO2 film by the plasma-CVD method, were deposited on 10000A or more thickness of 15000A or less, and the through hole was formed further. Connection with the oscillator circuit shown in drawing 6 is made through this through hole.

[0103] This N-Mos circuit is formed before forming a pressure regulation means and a pressure detection means.

[0104] <Ink jet recording device> The outline perspective view of an ink jet recording device which carries the ink tank which equipped drawing 17 with the solid form semiconductor device of this invention is shown. The head cartlidge 601 carried in the ink jet recording apparatus 600 shown in drawing 17 has the liquid discharge head which carries out the regurgitation of the ink for printing record, and an ink tank as shown in drawing 1 holding the liquid supplied to the liquid discharge head. Moreover, an external energy supply means 622 to supply the electromotive force which is external energy to the solid form semiconductor device (un-illustrating) allotted in the ink tank, and a means (un-illustrating) to communicate a solid form semiconductor device and information bidirectionally are installed in the recording device 600.

[0105] The head cartlidge 601 is carried on the carriage 607 engaged to the spiral slot 606 of a leading screw 605 which is interlocked with the forward inverse rotation of a drive motor 602, and is rotated through the driving force transfer gears 603 and 604, as shown in drawing 17 . Along with a guide 608 in carriage 607, both-way migration of the head cartlidge 601 is carried out in the direction of arrow heads a and b by the power of a drive motor 602. The ink jet recording apparatus 600 is equipped with a recorded-media conveyance means (un-illustrating) to convey the print form P as recorded media which receive liquids, such as ink breathed out from the head cartlidge 601. The paper presser-foot plate 610 of the print form P which has a platen 609 top conveyed presses the print form P to a platen 609 covering the migration direction of carriage 607 with the recorded-media conveyance means.

[0106] Photo couplers 611 and 612 are arranged near the end of a leading screw 605. Photo couplers 611 and 612 are the home-position detection means for checking existence [ in the field of photo couplers 611 and 612 of lever 607a of carriage 607 ], and

performing a switch of the hand of cut of a drive motor 602 etc. Near the end of a platen 609, it has the supporter material 613 which supports the wrap cap member 614 in the front face with the delivery of a head cartlidge 601. Moreover, it has an ink suction means 615 to attract the ink with which air ejecting etc. was carried out from the head cartlidge 601, and the interior of the cap member 614 was covered. Suction recovery of a head cartlidge 601 is performed by this ink suction means 615 through opening of the cap member 614.

[0107] The ink jet recording device 600 is equipped with the body base material 619. The migration member 618 is supported by this body base material 619 movable in the right-angled direction to the cross direction, i.e., the migration direction of carriage 607. The cleaning blade 617 is attached in the migration member 618. A cleaning blade 617 may be a well-known cleaning blade of not only this gestalt but other gestalten. Furthermore, it has the lever 620 for starting suction in the suction recovery operation by the ink suction means 615, and it moves with migration of the cam 621 which engages with carriage 607, and, as for a lever 620, migration control of the driving force from a drive motor 602 is carried out with a means of communication with a well-known clutch switch etc. The ink jet record control section which gives a signal to the heating element prepared in the head cartlidge 601, or manages drive control of each device mentioned above is prepared in the body side of a recording device, and is not shown by drawing 24.

[0108] In the ink jet recording device 600 which has the configuration mentioned above, a head cartlidge 601 carries out both-way migration covering full [ of the print form P ] to the print form P which has a platen 609 top conveyed by the aforementioned recorded-media conveyance means. If a driving signal is supplied to a head cartlidge 601 from a driving signal supply means by which it does not illustrate at the time of this migration, according to this signal, ink (record liquid) will be breathed out from the liquid discharge-head section to recorded media, and record will be performed.

[0109] <Ink tank> Although the example which holds ink in the part which constitutes the outer wall of an ink tank directly was shown in drawing 1 , this invention is applicable also to an ink tank as shown in drawing 18 .

[0110] The ink tank shown in drawing 18 has the outer wall 52 which constitutes the case of a tank, and the ink storage bag 53 which was contained inside the outer wall 52 and which has flexibility, and ink is held in the ink storage bag 53. The role which prevents that the confidentiality of ink improves and a chemical reaction advances by this by making into a catalyst the ingredient which is easy to disassemble by the ultraviolet radiation from the outside etc., and ultraviolet radiation is played. In such

an ink tank, the solid form semiconductor device 51 of this invention can be allotted to an outer wall, and the internal pressure between an outer wall 52 and the ink storage bag 53 can be kept constant by this solid form semiconductor device 51 to the negative pressure which changes with consumption of the ink from an ink feed hopper.

[0111] In the above, about this invention, the case where the pressure in the ink tank used for an ink jet recording device was adjusted was mentioned as the example, and was explained. It is the case apply to carrying out the optimal maintenance of the pressure in an ink tank about the ink jet printer printed in a record form by the ink droplet which this invention is applicable not only in this but any [ which adjusts the pressure in the container of closed mold ] case, but the most desirable one supplies the ink held in an ink tank which was explained with each operation gestalt mentioned above, and with which it was equipped removable to an ink-jet recording head, and is injected from the recording head.

[0112] Moreover, although the case where a pressure regulation means was driven based on the pressure in the ink tank detected by the pressure detection means was mentioned as the example and the above explanation explained it, when a solid form semiconductor device is used for an ink tank, the consumption of the ink in an ink tank can be about presumed from the drive frequency of a recording head. Moreover, if the amount of ink in the ink tank in an initial state (intact condition) is fixed, a correlation is between the consumption of ink, and the pressure in an ink tank. Therefore, if it asks for the relation between the drive frequency of a recording head, and the pressure in an ink tank by measurement etc. beforehand, even if it does not have a pressure detection means, a pressure regulation means is driven based on the drive frequency of a recording head, and the pressure in an ink tank can also be kept suitable.

[0113]

[Effect of the Invention] As explained above, according to this invention, the energy from the outside can be transformed into the energy of a different class, and the negative pressure in a container can be prepared by the exterior and non-contact by making the function in which this changed energy adjusts the negative pressure in a container, to a solid form semiconductor device. While the negative pressure in an ink tank is appropriately maintainable by applying the solid form semiconductor device of this invention to an ink tank especially so that the regurgitation of the ink from a discharge head can be performed good, the hold effectiveness of ink can be raised.

[Translation done.]

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## DESCRIPTION OF DRAWINGS

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[Brief Description of the Drawings]

[Drawing 1] It is the outline sectional view of the ink tank by the gestalt of operation of the 1st of this invention.

[Drawing 2] It is a block block diagram showing the internal configuration of the solid form semiconductor device shown in drawing 1 , and the exchange with the exterior.

[Drawing 3] It is a flow chart for explaining actuation of the solid form semiconductor device shown in drawing 2 .

[Drawing 4] It is a block block diagram showing the internal configuration of the solid form semiconductor device by the gestalt of operation of the 2nd of this invention, and the exchange with the exterior.

[Drawing 5] It is a flow chart for explaining actuation of the solid form semiconductor device shown in drawing 4 .

[Drawing 6] It is drawing for explaining the example which generates power using the electromagnetic induction of the energy conversion means which is the component of the solid form semiconductor device of this invention.

[Drawing 7] It is drawing explaining an example of the structure of the pressure regulation means formed in the solid form semiconductor device of this invention.

[Drawing 8] It is drawing explaining the production process of the pressure regulation means shown in drawing 7 .

[Drawing 9] It is the top view of the solid form semiconductor device in the condition which shows in drawing 8 (f).

[Drawing 10] It is the representative circuit schematic of the electric configuration relevant to the pressure regulation means shown in drawing 7 .

[Drawing 11] It is the timing chart of an example of the impression signal to the bulb electrode and base electrode of the pressure regulation means shown in drawing 7 .

[Drawing 12] It is drawing explaining an example of the structure of the pressure

detection means formed in the solid form semiconductor device of this invention.

[Drawing 13] It is drawing explaining the production process of the pressure detection means shown in drawing 12 .

[Drawing 14] It is drawing explaining the production process of the pressure detection means shown in drawing 12 , and the process after the process shown in drawing 13 is shown.

[Drawing 15] It is the circuit diagram of the circuit which carries out the monitor of the output from a polish recon resistive layer shown in drawing 12 .

[Drawing 16] It is the typical sectional view which cut the solid form semiconductor device of this invention so that it might travel through N-MOS circuit component.

[Drawing 17] It is the outline perspective view of an ink jet recording device which carries the ink tank equipped with the solid form semiconductor device of this invention.

[Drawing 18] It is the outline sectional view of other examples of the ink tank by which this invention is applied.

[Drawing 19] In the 1st operation gestalt of this invention, it is drawing which expresses as a graph an example of the internal pressure information written in a solid form semiconductor device.

[Drawing 20] In the 2nd operation gestalt of this invention, it is drawing which expresses as a graph an example of the internal pressure information written in a solid form semiconductor device.

[Description of Notations]

1 Ink Tank

2 Ink Hold Room

3 Ink Feed Hopper

4 Recording Head

11, 21, 51 Solid form semiconductor device

12 22 Electromotive force

13 23 Power

14 24 Energy conversion means

15 25 Pressure detection means

16 26 Decision means

17 27 Information storage means

18 28 Pressure regulation means

29 Receiving Means

30 Input Signal

52 Outer Wall

53 Ink Storage Bag
101 External Resonance Circuit
102 Oscillator Circuit
200 Spherical Silicon
201 Base Electrode
202 PSG Film
203 Opening
204 Cu Film
205 Bulb Electrode
206 SiN Film
206a Slit
210,211 Moving part
221 Polish Recon Resistive Layer
222 Wiring
223 Protective Coat
225 Cavernous Section
212 Path

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[Translation done.]